REMARKS

In the Office Action, claims 1-19 were rejected. The Examiner indicated that all previous rejections were withdrawn, yet discussed the issues again in the "response to amendment" section of the Office Action. Applicants only address the new grounds for rejection below, and not these comments, as the previous rejections are now moot. All of the pending claims are believed to be allowable over the prior art reference. Reconsideration and allowance of all pending claims are respectfully requested in view of the arguments summarized below.

Rejections Under 35 U.S.C. § 103

Claims 1-5, 8-9, and 11-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Gosche, U.S. Patent No. 6,430,430, in view of Teboul, U.S. Patent No. 5,709,206. Claims 6-7, 10 and 17-19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Gosche in view of Udupa, U.S. Patent No. 5,812,691. Applicants respectfully assert that the present invention, as recited in independent claims 1, 8, 12 and 17 is patentable over Gosche, Teboul and Udupa either alone or in combination.

Claim 1, 8 and 12 and the Claims Depending Therefrom.

Independent claim 1 recites classifying a plurality of selected structures based on a plurality of image processing computations relating *respective T2 relaxation times* corresponding to each of the structures, and segmenting the MR images for each of the structures substantially concurrently based on the plurality of image computations. Independent claim 8 recites computing a plurality of image processing computations relating *respective T2 relaxation times* corresponding to each of a plurality of selected structures within the brain and segmenting the MR images for each of the structures substantially concurrently based on the plurality of image computations. Independent claim 12 recites a processor adapted to perform *concurrent segmentation* computations for a plurality of selected structures.

Applicants respectfully submit that, in the present application, the selected structures within the body of interest (e.g., the brain) are classified and/or segmented based on image processing computations relating respective T2 relaxation times corresponding to each of the structures. The application discloses that the T2 value is useful in distinguishing selected tissue types in a MR image since there is a T2 value associated with a given tissue type or brain structure. Further, the given T2 value may be visualized differently between dual echo images. Each of the image processing computations defined in the present application such as a scatter plot (SP), a T2 radial histogram (RH), a T2 median filter, and a dual echo MIP filter is based on T2 values and other information relating to T2. Further, applicants respectfully submit that, the MR images for each of the structures are segmented substantially concurrently based on the plurality of image computations, thereby reducing the image processing time.

The Gosche reference discloses standard data acquisition techniques for MRI such as proton density weighted ("PDw") data acquisition, a spin-lattice relaxation time ("T1s") data acquisition, and/or a spin-spin relaxation time ("T2w") data acquisition (*see,* column 50, lines 37-48, cited by the Examiner). This passage reads:

> Each MRI scan in the series includes one or more standard modalities or standard data acquisitions. For example, such standard data acquisitions include a proton density weighted ("PDw") data acquisition, a spin-lattice relaxation time ("T1s") data acquisition, and/or a spin-spin relaxation time ("T2w") data acquisition. Alternate standard acquisitions are acceptable. One of ordinary skill in the art will readily appreciate the trade-offs between the myriad factors associated with MRI brain scans including, but not limited to, the type of image to acquire, cost, time, resolution, slice thickness, distance between slices, and signal-to-noise ratios.

Additionally, Gosche also discloses segmentation and/or classification techniques using one or more knowledge rules (*see,* column 49, line 45-column 50, line 2, cited by the Examiner). The passage reads:

> In an embodiment of the instant invention, an automated, or computer-implemented, method of identifying suspected lesions in a brain is provided, by way of illustration, in FIG. 9. In Step S100, a processor or scanner provides a magnetic resonance image (MRI) of a patient's head, including a plurality of slices of the patient's head, which MRI comprises a multispectral data set that can be displayed as an image of varying pixel or voxel intensities. In Step S110, the processor identifies a brain area within each slice to provide a plurality of masked images of intracranial tissue. In Step S120, the processor, applies a segmentation technique to at least one of the masked images to classify the varying pixel intensities into separate groupings, which potentially correspond to different tissue types. In Step S130, the processor refines the initial segmentation into the separate groupings of at least the first masked image obtained from Step S120 using one or more knowledge rules that combine pixel intensities with spatial relationships of anatomical structures to locate one or more anatomical regions of the brain. In Step S140, the processor identifies, if present, the one or more anatomical regions of the brain located in Step S130 in other masked images obtained from Step S120. In Step S150, the processor further refines the resulting knowledge rule-refined images from Steps S130 and S140 to locate suspected lesions in the brain.

However, Gosche fails to disclose that such classification and/or segmentation can be done *based on T2 relaxation times*. The former passage simply discloses standard acquisition protocols while the latter passage discloses classification and segmentation based on "knowledge rules". There is no basis whatsoever to conclude that the "knowledge rules" should or could be based on T2 relaxation times.

The Examiner rebuts Applicants' position by arguing that "knowledge based rules" refer to KGHID (knowledge guided hyper intensity detection) that uses encoded knowledge of brain anatomy and MRI characteristics of individual tissues. The Examiner further states that the method requires no more than a segmentation of brain tissues and that the KGHID is able to identify sub cortical structures and hyper intense lesions based on these tissue classes (*see,* column 9, lines 27-42, cited by the Examiner). The passage reads:

> The above features and advantages are accomplished, for example, by an automated, knowledge-guided hyperintensity detection (KGHID) method or system that uses encoded knowledge of brain anatomy and MRI characteristics of individual tissues to reclassify pixels from an initial unsupervised tissue classification.
>
> The method/system herein described optionally requires no more than a reliable initial segmentation of brain tissues into classes of, for example, cerebral spinal fluid, white matter, gray matter and mixed boundary tissue. KGHID is then able to identify subcortical structures and hyperintense lesions using these tissue classes and encoded anatomical knowledge. This knowledge consists of pixel intensity relationships as found in the classified tissues.

The Applicants' respectfully assert that *the encoded knowledge of "brain anatomy" and "MRI characteristics" is not same as T2 relaxation times.* Thus, the use of encoded knowledge of brain anatomy and MRI characteristics of individual tissues via KGHID do not provide any basis to conclude that the "knowledge rules" should or could be based on T2 relaxation times. The Examiner did not apply Teboul at all in this regard, and Applicants need not address the absence of similar teachings from Teboul.

Further, the Examiner recognized that Gosche fails to disclose concurrent segmentation of MR images. However, the Examiner argued that Teboul in same field of medical diagnostic system teaches a plurality of transaxial ductal ultrasound scan images over longitudinal duct segment, and displaying them concurrently. *Applicants respectfully assert that the step of displaying the plurality of axial ductal images substantially concurrently is not same as the step of segmenting the MR images for each of the structures substantially concurrently based on the plurality of image computations.* Sementation and display are simply two entirely different processes, and cannot be compared or analogized as the Examiner would do.

In summary, as discussed above, the Gosche reference fails to disclose classification and/or segmentation based on T2 relaxation times. Further, Gosche

reference fails to disclose concurrent segmentation of MR images for a plurality of selected structures. Applicants further note that Teboul and Udupa fail to obviate these deficiencies in the teachings of Gosche. Hence Gosche, Teboul and Udupa, alone or in combination, do not teach, suggest or disclose each and every aspect of the invention as recited in the independent claims 1, 8 and 12. The references therefore cannot support a *prima facie* case of obviousness of claims 1, 8 and 12.

Claims 2-7, 9-11, and 13-16 depend directly or indirectly from claims 1, 8 and 12 respectively. Accordingly, Applicants submit that claims 2-7, 9-11, and 13-16 are allowable by virtue of their dependency from an allowable base claim. Applicants also submit that the dependent claims are further allowable by virtue of the subject matter they separately recite. Thus, it is respectfully requested that the rejection of claims 12-39 under 35 U.S.C. §103(a) be withdrawn.

Claim 17 and the Claims Depending Therefrom.

Independent claim 17 recites a method for filtering dual echo images acquired by MR imaging. The method includes selecting a desired echo, implementing a maximum intensity projection (MIP) on the selected echo, and identifying a spatial location of the implemented MIP. The spatial location is then used to extract values from subsequent echoes.

The Examiner recognized that Gosche fails to disclose the use of maximum intensity projections. However, the Examiner argued that Udupa in same field of medical diagnostic systems teaches a popular method of visualizing the vessels via 3D renditions created by MIP. Even if this were true, neither reference, alone or in combination, teaches or suggests use of MIP *for filtering dual echo images*. On the contrary, Gosche would lead a person skilled in the art to believe that there is no need to resort to other techniques, such as MIP. Gosche discloses many filtering techniques, such as ANN based filtering, 3D diffusion filtering, 3D anisotropic diffusion filtering for removing

artifacts, correcting inhomogeneity and improving signal to noise ratio. Nothing in the reference would lead one skilled in the art, absent the present application, to make the MIP substitution proposed by the Examiner.

Furthermore, Udupa does mention the use of MIP as well as certain MR pulse sequences. However, these are disclosed in completely separate examples and are *never* combined. Indeed Udupa states:

> A problem with MIP is that it is accompanied by considerable clutter, and since there is no model of reflection, aspects of the vessels at different distances with respect to the viewpoint are not distinguished easily. This leads to some confusion in stationary views. However, based on over 10 patient studies conducted so far, 3-fuzzy object extraction using Algorithm .kappa.FOE seems to be an effective solution to extract vessels in MRA. (*see,* column 20, line 63-column 21, line 3)

Significantly, this algorithm, *said to solve problems with MIP, is not the same algorithm as the one used for MR sequences* (*see,* column 21, line 63-column 22, line 12). Clearly, then, even Udupa does not suggest mixing these techniques, and rather teaches away from such combination.

The Examiner rebutted Applicants' position by arguing that "location of MIP" is a broad limitation, and the claim limitation therefore does not require identifying the exact coordinate of the pixels depicting the MIP. The Examiner further stated that the Udupa does identify the location of the MIP in terms of direction (*see,* column 20, line 53 – column 21, line 3, and Fig. 3d, cited by the Examiner). *Clearly, even if this were true, this do not supply any basis to indicate the use of MIP for filtering dual echo images by selecting a desired echo, implementing a MIP on the selected echo, and identifying a spatial location of the implemented MIP wherein the spatial location is then used to extract values from subsequent echoes.*

Hence the Gosche and Udupa references, alone or in combination, do not teach, suggest or disclose each and every aspect of the invention as recited in the independent claim 17. The references therefore cannot support a *prima facie* case of obviousness of claim 17.

Claims 18-19 depend directly or indirectly from claim 17. Accordingly, Applicants submit that claims 18-19 are allowable by virtue of their dependency from an allowable base claim. Applicants also submit that the dependent claims are further allowable by virtue of the subject matter they separately recite. Thus, it is respectfully requested that the rejection of claims 17-19 under 35 U.S.C. §103(a) be withdrawn.

Conclusion

In view of the remarks and amendments set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: 12/8/2005

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